PATENT SPECIFICATION

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Int. Cl.:—B 22 d // B23p, F02f.

COMPLETE SPECIFICATION

DRAWINGS ATTACHED

Improvements in or relating to Silencers for Motor Vehicles

I, FRANK LEONARD KLEINIG, of 404 Parramatta Road, Burwood, in the State of New South Wales, Commonwealth of Australia, a British subject, do hereby declare the invention, for which I pray that a Patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to silencers for motor vehicles and to a method of making silencers.

The object of the invention is to provide a silencer which is particularly durable and effective in use and a method by which certain forms of the invention can be manufactured easily and economically.

At the present time all silencers in normal commercial use are made from mild steel material, the sheet being rolled into cylindrical form and end covers attached to the cylinder so formed. While such silencers are effective, their life is short owing to the fairly rapid deterioration of mild steel by rusting. The use of other materials such as aluminium or stainless steel presents certain economic and manufacturing difficulties one of which is the provision of a cheap and effective means for forming and attaching end covers to a silencer.

The present invention provides a construction and a method of manufacture for silencers which assists in overcoming this particular difficulty.

The invention consists in a silencer for a motor vehicle having a tubular body of corrosion resistant sheet metal such as aluminium or stainless steel and end covers made by casting from aluminium, each end cover being secured to one end of the tubular body and having set in it an end pipe, the end pipe having been set in position during the casting of the end cover or having been pressed into it after casting.

The end covers may be secured to the body by means of bolts arranged around the periphery of the cover and passing through a ring surrounding the end of the body, the end portion of the body being clamped between the end cover and the ring. In an alternative arrangement the end cover may be secured to the body by casting it around the end of the body. The term 'casting' is to be taken to include the process defined in the next succeeding paragraph.

The invention also consists in a method of making a silencer including the steps of forming an inwardly flared flange or a plurality of radial holes at one end of a tubular body for a silencer or otherwise treating the end to form a key with an end cover, melting aluminium in an open mould corresponding in shape to the end cover after setting an end tube in the mould so that it projects on either side thereof, holding the body in a vertical position over the mould, offering the mould up to the body to immerse the end of the body in the molten aluminium and thereafter cooling the mould to cause the aluminium to solidify.

In order that the invention may be better understood and put into practice, preferred forms thereof are hereinafter described, by way of example, with reference to the accompanying drawings, in which:

Figs. 1 and 2 are perspective views illustrating the method of making silencers according to the invention, and

Figs. 3 to 6 are part-sectional perspective views of the end portions of silencers showing different ways in which an end cover may be attached to a silencer.

Considering Figs. 3 to 6 firstly, in each figure 10 denotes the cylindrical body of the silencer which is formed preferably from aluminium sheet, although other corrosion resistant materials such as stainless steel may be used.

Down the centre of the aluminium tube 10 extends a tube 11 the wall of which is perforated with a considerable number of holes. This perforated tube 11 is aligned with and connected to the short length of end tube 12 at each end of the silencer so that the exhaust gases pass straight through the silencer. The space 13 between the inner perforated tube 11 and the outer aluminium tube 10 is packed with fibre glass which is preferably in the form of a batt or strip which is applied around the inner perforated tube. As is well known, the arrangement described has a silencing effect by the absorption of sound waves in the fibre glass through the holes in the inner perforated tube.

In Fig. 4 to the end of the tube 10 there is attached an end cover 14*b* in the form of an aluminium casting around the circumference of which are formed a number of bolt holes. The end cover 14*b* is formed with a spigot having an external frusto conical face which just fits within a flared portion 15 of the end of the aluminium tube 10. It is secured to the tube by means of a ring 16 of similar material having an internal annular frusto conical face which corresponds to the external surface of the flared portion 15 at the end of the tube 10. This ring 16 is also provided with holes around its periphery corresponding to those in the end cover, bolts 17 are passed through these holes and the ring and the end cover are bolted together to grip the flared end of the aluminium tube 10 between them.

In Fig. 3 the construction is very much the same as that shown in Fig. 4 except that the end cover 14a is held in position by hook bolts 18 in place of the bolts 17.

In the centre of each end cover 14a and 14b is formed a hole into which is pressed a short length of steel end tube 12 which is arranged to project to a sufficient distance from the outer face of the end cover to enable the exhaust pipe from the engine of the vehicle, or the tail pipe of the exhaust system as the case may be, to be attached to the silencer in a conventional manner. The relative diameters of the end tube and the hole in the end cover are chosen so that when the silencer reaches its normal operating temperature the tube is still a tight fit in the hole of the end cover. The end tube 12 may be set in position in the mould during the casting of the end cover so that on cooling the end tube is set firmly in place.

While the constructions shown in Figs. 3 and 4 provide a satisfactory means of attaching the end covers and while these constructions have the advantage that the end covers may be removed from the silencer, the constructions shown in Figs. 5 and 6 are to be preferred on the grounds of low cost, ease of manufacture and neatness of appearance. In practice a silencer may be constructed having one fixed end such as is shown in Figs. 5 and 6 and one removable end as is shown in Figs. 3 and 4. This enables the silencer to be repacked from time to time.

In Figs. 5 and 6 end covers 14c and 14d are attached to the end of the aluminium tube 10 by the method described below with reference to Figs. 1 and 2. The only difference between the two constructions is that whereas in Fig. 5 a plurality of radial holes 21 are formed in the end of the tube 10 to provide a key for the material of the end cover 14c in Fig. 6 the end 22 of the tube 10 is flared inwardly for the same purpose. It will be appreciated that the end of the tube 10 may be treated in a number of other ways to form a key with the end cover.

In each of Figs. 3 to 6 the end of the silencer not shown may be of the same construction as the end shown or of any of the constructions shown in the other Figures.

Silencers made as described above are very simple to make and by the use of an external aluminium tube are very durable as aluminium does not rust in the same way as steel.

These constructions may be varied in a number of ways. For example the silencing properties may be improved by omitting a portion of the fibre glass packing 13 from the central portion of the silencer and also by surrounding the outer aluminium tube by a corrugated sleeve of aluminium which tends to damp out resonances which might otherwise occur at certain speeds.

Where it is necessary to use an outer aluminium tube of relatively large diameter, it may be found convenient for purposes of installation to manipulate the central portion of the tube to convert it from a circular to an oval cross-section. It is also possible to form the whole tube so that it is of oval cross-section, the end covers in the case of Figs. 3 and 4 being turned or ground on a suitable lathe so as to provide oval surfaces corresponding to the frusto conical surfaces formed on the circular end covers.

Where the aluminium tube is of oval cross-section, the construction of the silencer may be modified by forming the hole in each end piece off-centre, the hole at each end being on either side of the axis of the silencer. A perforated tube is attached to each end of the silencer and is led to a central compartment at the middle of the silencer. In such an arrangement the gases cannot flow straight through the silencer but must move laterally within the compartment from one perforated tube to the other.

A variety of other modifications of the details of construction are possible, for example the perforated tube 11 may be formed by rolling a sheet of perforated material to form a scroll so that in effect a tube having a number of layers is formed and this is found to give improved silencing qualities to the silencer. Other modifications will occur readily to those skilled in the art.

The method of making silencers having end covers attached in the manner shown in Figs. 5 and 6 is illustrated in Figs. 1 and 2. In these figures a framework 23 is used to support a clamp 24 by means of which the body 25 of a silencer may be held in a vertical position. The clamp 24 consists of a pair of jaws 26 shaped to fit around the body 25 of a silencer and which may be moved laterally by levers 27 into and out of a clamping position. It will be obvious that any conventional clamping means may be used for the purpose and it is therefore not proposed to describe it in further detail.

The framework 23 also supports a platform 28 which may be raised or lowered by a hydraulic ram 31. It is shown lowered in Fig. 1 and raised in Fig. 2.

A gas ring 32 rests on the platform 28 and this may be connected by pipe 33 to a gas supply or by pipe 34 to a supply of compressed air by means of the cock 35.

A mould or die 36, the internal shape of which corresponds with the external shape of the end cover 37 is supported above the gas ring 32. The mould 36 has a central hole into which an end pipe 38 is a push fit.

The apparatus is used in the following manner. The tubular body 25 of a silencer is treated at each end in a manner such as is described in connection with Figs. 5 and 6 to form a key with an end cover. It is preferably packed with fibre glass and fitted with a central perforated tube before an end cover is fitted although one end cover may be fitted bfeore this is done. The body 25 is then set in the clamp 24 in the position shown in Fig. 1. An end tube 38 is then passed through the central hole in the mould to project on either side of the mould. It will be seen that the end tube in effect forms a part of the mould.

The mould 36 is then heated by means of a gas flame from the gas ring 32 and the mould is filled with molten aluminium which is maintained in this condition by heat from the gas flame. The platform 28 is then raised by means of the hydraulic jack 31 to offer the mould 36 up to the end of the silencer body 25. When the end of the body is immersed to the correct depth, movement of the platform is stopped, the cock 35 is used to cut off the supply of gas to the gas ring and to substitute for it a blast of compressed air which quickly cools the mould 36 and causes the aluminium to solidify. The silencer body 25 with the end cover 37 and end tube 38 attached may then be removed from the apparatus. After one end cover has been affixed the other may be attached by simply reversing the position of the body in the clamp 24 and repeating the operation.

When the mould is offered up to the silencer body 25 the end tube 38 fits within the inner perforated tube (reference 11 in Figs. 3 to 6) and if desired the length of this latter tube may be such that it projects into the mould 36 and is then also cast into the end cover.

The method described above provides a very simple and inexpensive means of applying end covers to the body of a silencer having an aluminium tubular body or a tubular body of other corrosion resistant material.

Whenever in Figs. 1 and 2 the mould 36 is shown as being circular the method is equally well applicable to silencers of oval cross-section it being only necessary to make a mould of suitable shape.

WHAT I CLAIM IS:—

1. A silencer for a motor vehicle having a tubular body of corrosion resistant sheet metal such as aluminium or stainless steel and end covers made by casting from aluminium, each end cover being secured to one end of the tubular body and having set in it an end pipe, the end pipe having been set in position during the casting of the end cover or having been pressed into it after casting.

2. A silencer as claimed in Claim 1 wherein one or both end covers are secured to the body by means of bolts arranged around the periphery of the cover and passing through a ring surrounding the end of the body, the end portion of the body being clamped between the end cover and the ring.

3. A silencer as claimed in Claim 1 wherein one or both end covers are secured to the body by casting each end cover around one end of the body.

4. A method of making a silencer including the steps of forming an inwardly flared flange or a plurality of radial holes at one end of a tubular body for a silencer or otherwise treating the end to form a key with an end cover, melting aluminium in an open mould corresponding in shape to the end cover after setting an end tube in the mould so that it projects on either side

thereof, holding the body in a vertical position over the mould, offering the mould up to the body to immerse the end of the body in the molten aluminium and thereafter cooling the mould to cause the aluminium to solidify.

5. A silencer as claimed in Claim 1 having one or both end covers attached substantially as shown in either of Figs. 3 or 4 of the accompanying drawings.

6. A silencer as claimed in Claim 1 having one or both end covers attached substantially as shown in either of Figs. 5 or 6 of the accompanying drawings.

7. A method of making a silencer substantially as described with reference to Figs. 1 and 2 of the accompanying drawings.

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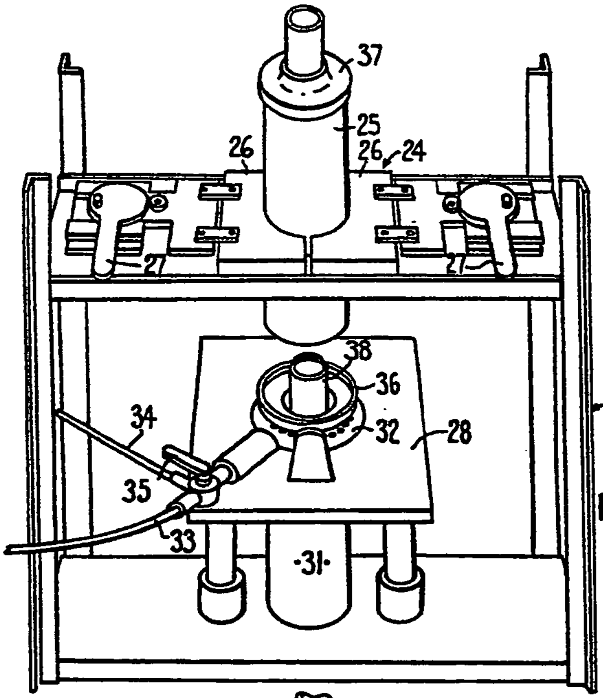

FIG.1

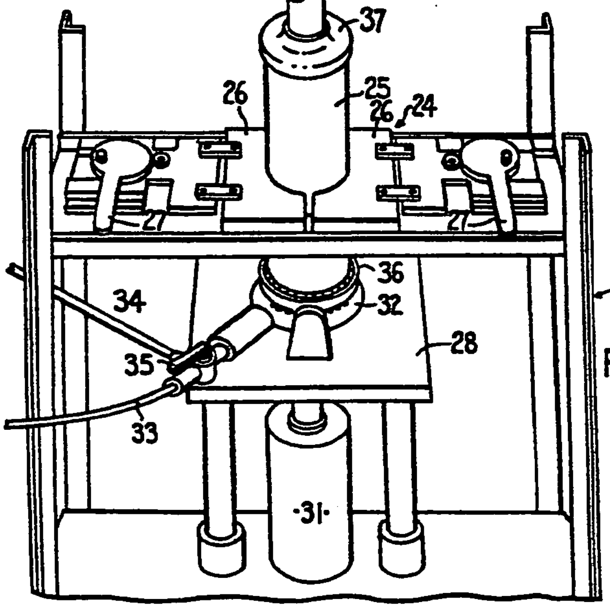

FIG.2

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2 *SHEETS*

This drawing is a reproduction of the Original on a reduced scale.
SHEETS 1 & 2

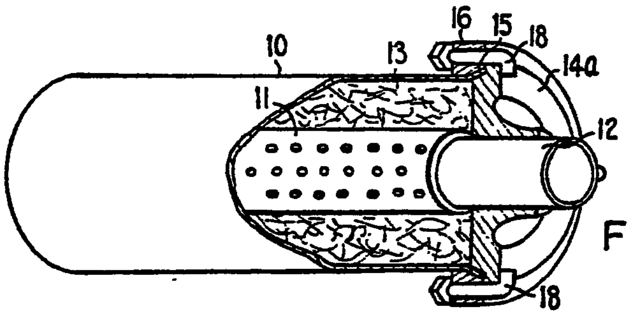

FIG. 3

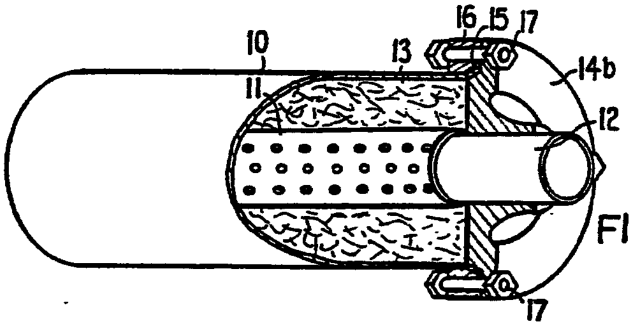

FIG. 4

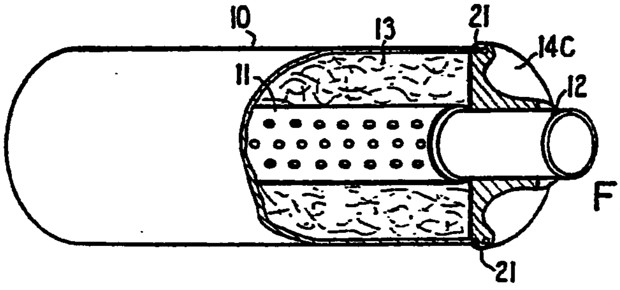

FIG. 5

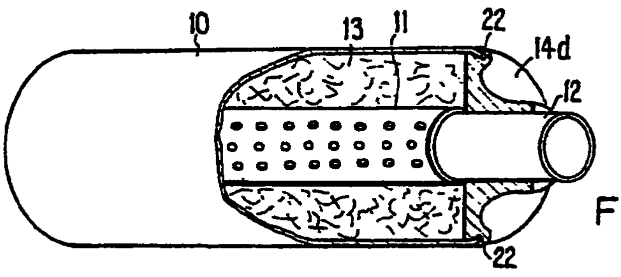

FIG. 6

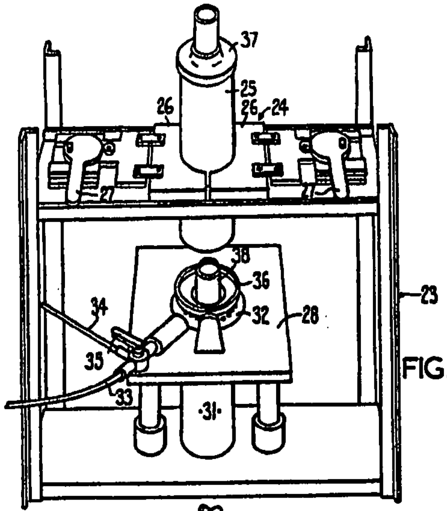

FIG.1

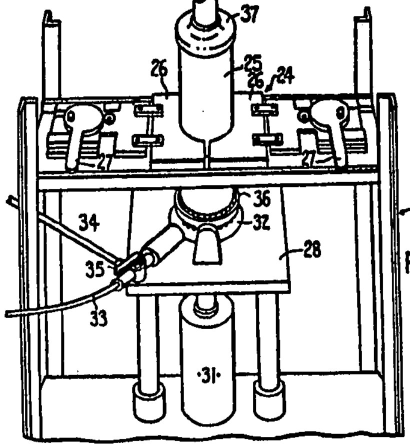

FIG.2

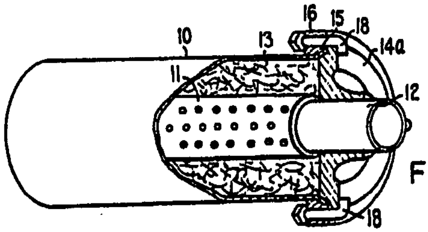

FIG.3

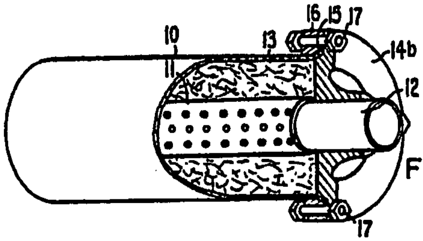

FIG.4

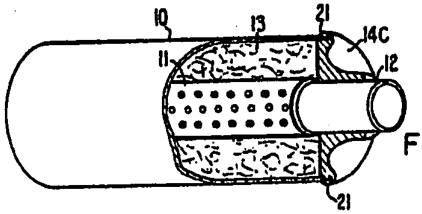

FIG.5

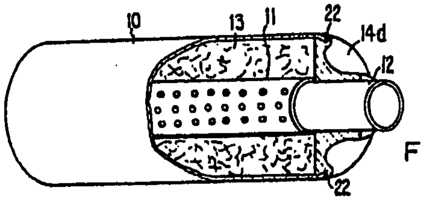

FIG.6